

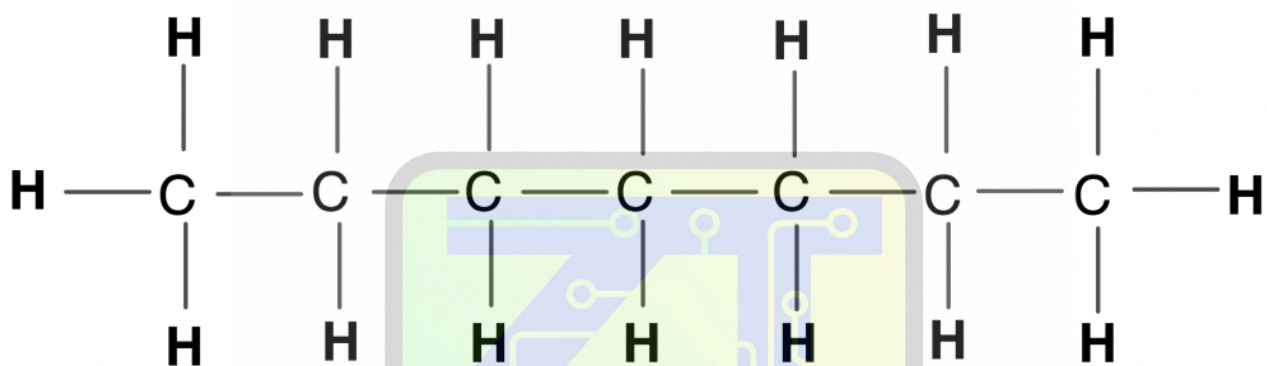
## QUALITY OF PETROL (OCTANE NUMBER)

### Octane Rating/Number

Octane rating or octane number is the measure of the value of the performance of fuel for a combustion engine. The rating depends on the percentage composition of branch chain to straight-chain hydrocarbons in the fuel. Branch chain hydrocarbons perform better as fuel in engines and have high octane rating.

High-grade petrol has an octane rating closer to 100 while low-grade petrol has an octane number around 0. Low-grade petrol causes knocking of the motor engines. This reduces the efficiency of the engine as well as shortens its life span.

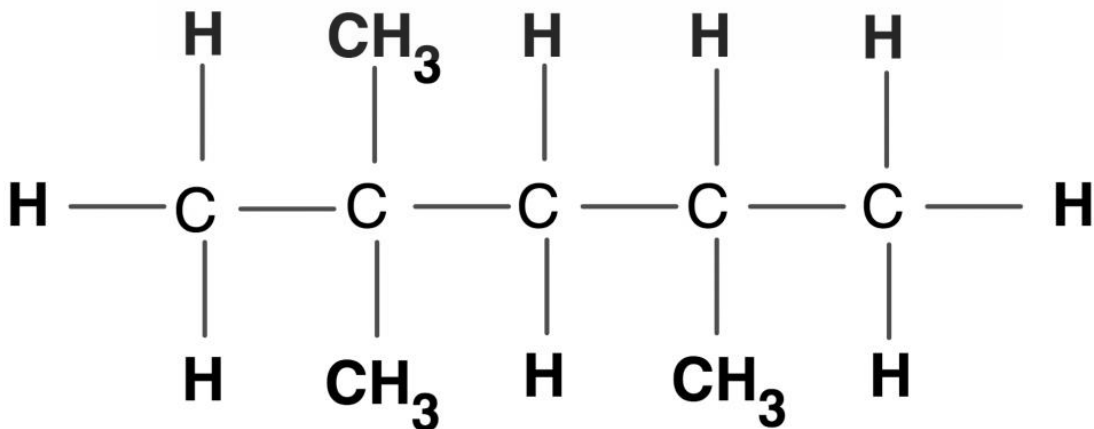
Low grade petrol: octane rating = 0



*n*-heptane

Heptane or n-heptane is the straight-chain alkane with the chemical formula  $\text{H}_3\text{C}(\text{CH}_2)_5\text{CH}_3$  or  $\text{C}_7\text{H}_{16}$ , and is one of the main components of gasoline. When used as a test fuel component in anti-knock test engines, a 100% heptane fuel is the zero point of the octane rating scale.

High grade petrol: octane rating = 100



*2, 2, 4* - trimethylpentane

### Use of Additives to Improve Octane Rating:

The octane number of fuel can be improved by the addition of additives. For example, tetraethyl lead (IV),  $\text{Pb}(\text{C}_2\text{H}_5)_4$ , was once used as an additive to increase the octane rating of low-grade petrol. However, because of the dangers it possess to the environment, it is no longer used for that purpose. Aromatic alcohols, ethanol, and methanol are among substances used as additives that increase the octane number of petrol. These additives cause very little pollution when they are burnt and they are cleaner fuels.

### Evaluation Questions:

1(a). Define octane rating? Why is it important?

(b). Give a reason why ethanol and methanol are used as additives in petrol.

2(a). Write the molecular formula of the compound to which 2, 2, 4 – trimethylpentane is an isomer.

### SOLUTION

1(a). Define octane rating? Why is it important?

**Answer:** Octane rating is the measure of the value of the performance of fuel for combustion engine. It is important because it helps to determine the performance of fuel and also state the percentage composition of branch chain to straight-chain hydrocarbons in the fuel.

(b). Give a reason why ethanol and methanol are used as additives in petrol.

**Answer:** They increase the octane number of petrol and they cause very little pollution when burnt.

2(a). Write the molecular formula of the compound to which 2, 2, 4 – trimethylpentane is an isomer.

**Answer:** 2,2,4- trimethylpentane –  $\text{C}_8\text{H}_{18}$